RI-FS FIELD SAMPLING PLAN ADDENDUM No. 1

Falcon Refinery Superfund Site
Ingleside
San Patricio County, Texas
TXD 086 278 058

Prepared for

National Oil Recovery Corporation
3717 Bowne Street
Flushing, NY 11354

May 29, 2009

Prepared by

Kleinfelder
1826 Kramer Lane, Suite M
Austin, Texas 78758

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

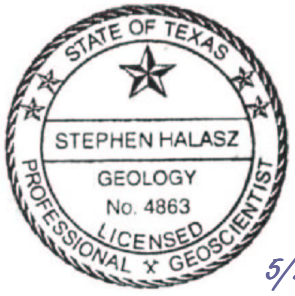
ABBREVIATIONS AND ACRONYMS

API	American Petroleum Institute
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BG	Background
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	Chemical of Potential Concern
COPEC	Chemical or Compound or Contaminant of Potential Ecological Concern
CSM	Conceptual Site Model
DQO	Data Quality Objective
DTW	Depth to Water
EB	Equipment Blank
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
FS	Feasibility Study
FSP	Field Sampling Plan
G	Grid Sample
gpm	Gallons Per Minute
GPS	Global Positioning System
HHRA	Human Health Risk Assessment
HRS	Hazard Ranking System Documentation Record, Falcon Refinery
IDW	Investigation-Derived Waste
J	Judgmental Sample
MD	Matrix Duplicate
µg/L	Microgram per Liter
µg/kg	Microgram per Kilogram
mg/kg	Milligram per Kilogram
MS	Matrix spike
MSD	Matrix spike duplicate
MSSL	Medium-specific Screening Level
MW	Permanent Monitor Well
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NORCO	National Oil Recovery Corporation
NPL	National Priorities List
OU	Operating Unit
PCB	Polychlorinated Biphenyl
PCL	Protective Concentration Limit
PID	Photoionization Detector
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride

QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Removal Action
RAW	Removal Action Work Plan
RBSL	Risk Based Screening Level
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RPM	Remedial Project Manager
S	Soil Sample
SD	Sediment Sample
SOP	Standard Operating Procedure
Superior	Superior Crude Oil Gathering
SVOC	Semi-Volatile Organic Compound
SW	Surface Water Sample
TB	Trip Blank
TCEQ	Texas Commission on Environmental Quality
TCLP	Toxicity Characteristic Leaching Procedure
TNRCC	Texas Natural Resources Conservation Commission
TPH	Total Petroleum Hydrocarbons
TRV	Toxicity Reference Value
TW	Temporary Monitor Well
UCL	Upper Confidence Level
USCS	Unified Soil Classification System
VOC	Volatile Organic Compound
VSP	Visual Sample Plan
WBZ	Water Bearing Zone

To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Stephen Halasz, Project Coordinator



5/29/2009

1.0 INTRODUCTION

The following Field Sampling Plan (FSP) Addendum, prepared by Kleinfelder, on behalf of National Oil Recovery Corporation (NORCO), utilizes the results of Phase I sampling and defines the sampling and data gathering methods to be used to define the nature and extent of contamination and human and ecological risk for Phase II at the former Falcon Refinery located near Ingleside, San Patricio County, Texas (Figure 1). Specifically, the FSP will include Phase II sampling objectives, sample locations and frequency, sampling equipment and procedures and sample handling and analysis. All work will be performed in compliance with the U.S. Environmental Protection Agency's (EPA) guidance document titled, *Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.*

Field sampling activities related to the disposal of on-site hazardous materials (referred to as the Removal Action (RA)) at the former Falcon Refinery site will be performed in accordance with the approved FSP dated August 24, 2007.

The Quality Assurance Project Plan (QAPP) and QAPP Addendum are companion documents to this FSP Addendum and provide information concerning the rationale for the sampling strategy, laboratory procedures and the Quality Assurance/Quality Control (QA/QC) procedures to be employed in this FSP Addendum.

Section numbering in this report is similar to the numbering in the FSP. Only sections that requiring updating or are pertaining to Phase II are included.

1.1 Phase II Investigation Overview

Described in this section is the Phase II assessment plan for this FSP Addendum. Details of the methodologies used to perform the activities are described in the Standard Operating Procedures (SOP) provided as Appendix A of the approved FSP.

For Phase I, the number of soil, sediment, groundwater, and surface water judgmental or random grid sampling locations were initially determined by the Site Team and were not based on the distribution of constituents, if any, at the site. Phase I helped to determine the distribution of constituents at the site and served as the basis for this FSP Addendum.

When the data from Phase I were obtained and analyzed, the standard deviation, alpha and beta error rates, width of the gray region, and a threshold value (screening value) were then used in Phase II as input into Visual Sample Plan (VSP) software algorithms to statistically determine the minimum number of samples required to meet the Data Quality Objectives (DQO) for the site.

For human health and ecological risk assessment screening purposes, any chemicals detected at the site above their respective screening levels will be carried forward in the risk assessments required by the National Contingency Plan (NCP), taking into account synergistic effects. For ecological risk assessment screening purposes, bioaccumulative chemicals may need to be carried forward in the risk assessment if found below their respective screening levels.

For both the human health and ecological risk assessments, the maximum detected concentrations will be used for risk screening purposes. The statistically derived 95% upper confidence limit (UCL) of the arithmetic mean (if the sample size is adequate) or maximum concentration (if the sample size is inadequate), whichever is appropriate for a given medium, will be calculated for use as the concentration term in the risk assessment equations following the risk screening process. The statistical methods described in EPA guidance documents for calculating UCLs are based on the assumption of random sampling.

1.1.1 Phase I On-Site Investigation

The following on-site Phase I sampling activities were performed:

- Collected judgmental surface and subsurface soil samples at former operating units (OU) at the north and south sites using a Geoprobe and/or hand sampling device;
- Collected random start grid composite surface and subsurface soil samples from areas of the site not associated with former OUs using a Geoprobe; and
- Installed and sampled temporary monitor wells using a Geoprobe at locations with the highest probability of groundwater impacts. The temporary monitor wells were abandoned prior to demobilization from the site.

1.1.2 Phase I Off-Site Investigation

The following off-site Phase I sampling activities were performed:

- Collected judgmental sediment, surface and subsurface soil samples at background locations in areas located outside the area of probable impact from the site, in similar settings to those being evaluated;
- Collected judgmental surface and subsurface soil at residential locations adjacent to the site;
- Collected random start grid sediment samples in the wetlands;
- Collected judgmental sediment and surface/subsurface soil samples along the active and inactive pipelines leading to the current and former barge dock

facilities; and

- Sampled surface water in the wetlands and bay adjacent to the site.

Provided as Appendix A are figures showing the analytical results of the Phase I sampling and analysis. Data are presented by 1) area of concern (AOC), 2) matrix (groundwater, surface soil, subsurface soil, sediment and surface water), 3) analytical group (metals, volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC) and 4) analysis type (comparison to human health criteria or ecological criteria). Figures are also provided for background sampling.

Mapping criteria included listing chemicals of potential concern (COPCs) having either a single detection above an applicable screening value or a method detection limit above an applicable screening value.

Provided as Appendix B are the analytical results of the Phase I sampling.

1.2 Phase II Investigation

When the data from Phase I were obtained and analyzed, the standard deviation, alpha and beta error rates, width of the gray region, and a threshold value (benchmark human health or ecological screening value) were used in Phase II as input into VSP software algorithms to statistically determine the minimum number of samples required to meet the DQO for the site.

For the VSP evaluation of the minimum number of samples required to meet the DQOs for the site, an alpha error rate of 5% and a beta error rate of 10% were selected to balance the costs of additional samples against the usefulness of additional data for site management decisions. The analyte mean was assumed to be greater than the screening levels (i.e., site assumed to be “dirty”). The analyte standard deviation for each AOC media was used. Due to the nature of the data and analyte screening levels, the data was evaluated using two methods for identifying the width of the gray region (delta) and are described below:

Method 1 calculated delta is the difference between the analyte mean concentration and the screening value. This delta is useful for calculating the number of samples necessary to differentiate between the analyte mean and the screening value. However, when the difference between the mean and the screening value is less than the analyte standard deviation, a very large minimum sample number will be calculated. This method of calculating delta is described in *Guidance on Systematic Planning Using the Data Quality Objective Process*, EPA QA/G4, February 2006, available at http://www.epa.gov/QUALITY/qs-docs/g4-final.pdf. In this case, the screening value less the delta value can be described as the concentration above which decision makers will accept actually “clean” sites will be misclassified as “dirty”.

Method 2 delta is calculated independently of the analyte mean as a fraction of the screening value. This type of delta is useful for calculating the sample quantity necessary to differentiate an analyte mean from the screening value when only the analyte standard deviation can be reasonably predicted. However, when delta is less than the standard deviation, a very large minimum sample number will be calculated. For the purpose of evaluating Phase I data for the site, the delta was calculated as one half of the screening value. The range of appropriate values for Method 2 delta is given in the VSP User Guide as 0.2 to 0.95 of the screening value (Visual Sample Plan Version 5.0 User's Guide, September 2007, page 3.7). In this case, delta can be described as the fraction of the screening value above which decision makers will accept actually "clean" sites will be misclassified as "dirty".

Analyte data judged acceptable for minimum sample number calculation in VSP were those with at least four detected concentrations in an AOC media. For example, if at least four detected concentrations were present in AOC-1 Surface Soil, the analyte was evaluated for minimum sample number in AOC-1 Surface Soil. If the analyte was not detected at least four times in AOC-1 Subsurface Soil, it was not evaluated for minimum sample number in that media.

Analytical data flagged with "B", indicating it was detected in analytical blanks, was conservatively evaluated at the reported value without reference to if the analyte was a commonly detected laboratory contaminant or not. Analytical data flagged with "J" or not flagged were evaluated with the reported value. Analytical data flagged with "U", indicating it was not detected at the reported concentration, were divided by two prior to evaluation. Duplicate samples whether detected or not were evaluated at their average concentration, after adjustment for U-flagged values.

The VSP reports of minimum sample size calculations for each AOC media with analytes detected at least four times are presented as Appendix C. Because of formatting limitations within the VSP report function, refer to the beginning of Appendix C for an index of each report's applicable AOC, media, and delta method. Note the VSP software contains at least two errors in its reporting function impacting this work. The most significant error assigns potential new sample locations a concentration of zero for the first analyte listed in the table of analyte screening values prior to calculating the specific analyte's summary statistics for the report. Therefore an "analyte" named "New Location" was entered at the top of the table as a work-around enabling the VSP report to accurately calculate and present subsequent analyte summary statistics[1]. Tables detailing the results of each VSP evaluation are presented

[1] The second software error to impact this work occurs when areas within an AOC contain the same existing sample location (i.e. areas overlap). This results in the report double-counting data from a location and inaccurate summary statistic values. The work-around used was to merge all areas in an AOC prior to data entry. As a courtesy, VSP technical support personnel have been notified of these two software errors and the work-around used for each.

as Appendix D. Appendix D tables present brief summary statistics for each analyte evaluated, the minimum sample quantities calculated by VSP using Method 1 and Method 2 deltas, sample quantities based upon best professional judgment arrived at after further review of the data, and the proposed number of samples to be collected. Table 2 presents a summary of Appendix D proposed sample quantities for each AOC media during Phase II.

For human health and ecological risk assessment screening purposes, COPCs detected at the site above their respective screening levels will be carried forward in the risk assessments required by NCP, taking into account synergistic effects. For ecological risk assessment screening purposes, bioaccumulative chemicals may need to be carried forward in the risk assessment if found below their respective screening levels.

For both the human health and ecological risk assessments, the maximum detected concentrations will be used for risk screening purposes. The statistically derived 95% UCL of the arithmetic mean (if the sample size is adequate) or maximum concentration (if the sample size is inadequate), whichever is appropriate for a given medium, will be used as the exposure point concentration term during risk assessment following the screening process. The ProUCL software available from EPA will be used to calculate the concentration term (Version 4.0, dated April 2007, available at http://www.epa.gov/esd/tsc/software.htm). The statistical methods described in EPA guidance documents for calculating UCLs are based on the assumption of random sampling.

1.2.1 Phase II On-Site Investigation

- Additional surface and subsurface soil sampling;
- Installation of permanent monitor wells;
- Additional groundwater sampling; and
- Characterization of aquifer properties.

1.2.2 Phase II Off-Site Investigation

- Additional sediment sampling in the wetlands and bay;
- Biota sampling;
- Additional surface water sampling;
- Additional surface and subsurface soil sampling; and
- Installation of off-site monitor wells and groundwater sampling.

1.3 Sampling Objectives and Design

This FSP Addendum is based on site-specific DQOs developed from the comprehensive conceptual site model (CSM) and based on EPA and TCEQ guidance documents. EPA's DQO process is an important tool for defining the type, quality, and quantity of data needed to make defensible decisions.

The DQO approach, discussed in the approved FSP, will be followed in this Addendum. Section A7 of the Falcon Refinery QAPP presents the DQOs developed for the Falcon Refinery Remedial Investigation (RI).

During Phase II sampling, newly acquired analytical data will be evaluated to determine if sufficient data have been obtained which meet the sampling and data DQOs for the site. If the objectives have not been met, additional mobilizations and sampling will be presented.

2.0 CONCEPTUAL SITE MODEL

The purpose of the CSM is to identify pathways for COPC transport and potentially impacted media and receptors. In preparing the CSM, data gaps were identified based on the data needs for defining nature and extent of COPCs, conducting the Ecological Risk Assessment (ERA) and Human Health Risk Assessment (HHRA) and evaluating presumptive remedies for the site, if needed. Site-specific DQOs were developed based on the CSM and were subsequently used to develop the QAPP and FSP for the site.

2.1 Physical Profile

The Falcon Refinery site consists of a refinery which operated intermittently and is currently inactive. When in operation, the refinery had a capacity of 40,000 barrels per day and the primary products consisted of naphtha, jet fuel, kerosene, diesel, and fuel oil.

Further specific descriptions of the physical profile are provided in Section 2.1 of the FSP.

2.2 Areas of Concern

Seven areas of concern (AOC) have been identified as potential areas impacted by COPCs. Three AOCs are identified on-site and four are off-site. AOCs are summarized in Table 1 and shown on Figure 2**.** Each AOC is discussed in detail in Section 2.2 of the FSP.

For the purposes of this Phase II investigation, soil sample intervals will be divided into surface and subsurface soil. Surface soil is soil existing at a depth of 0.0 to 0.5 feet below ground surface (bgs). Subsurface soil includes all depths below 0.5 feet bgs.

2.2.1 AOC-1 Former Operational Units (OU)

Included in AOC-1 are: the entire North site; former OU areas of the South site; a drum disposal area; and an area where metal waste was discarded.

Preliminary COPCs to be screened at this AOC included metals, VOCs, SVOCs, polychlorinated biphenyls (PCBs) and pesticides/herbicides.

Potentially affected media include soil and groundwater.

Reports outlining the VSP-calculated minimum sample sizes with human health or ecological screening values as the benchmarks and using both delta methods are presented as Appendix C: Reports 1 through 4 correspond to AOC-1 surface soils;

Reports 5 through 8 correspond to AOC-1 subsurface soils; and Reports 9 and 10 correspond to AOC-1 groundwater.

Detailed summary tables of the VSP calculations are presented as Appendix D: Table D-1 corresponds to AOC-1 surface and subsurface soils with human health screening value benchmarks; Table D-2 corresponds to AOC-1 surface and subsurface soils with ecological screening value benchmarks; and Table D-3 corresponds to AOC-1 groundwater with human health screening value benchmarks.

2.2.2 AOC-2 On-Site Non-Operational Areas

Included in AOC-2 are areas of the refinery not used for operations or storage and have no record of releases.

Although no COPCs were anticipated in AOC-2, the screened COPCs included metals, VOCs and SVOCs.

Potentially affected media include soil and groundwater.

Minimum samples size calculations were not performed for composite samples collected during Phase I. The minimum sample quantity necessary for AOC-2 was evaluated using best professional judgment based upon review of site history and analytical results for the composite samples.

2.2.3 AOC-3 Wetlands

Included in AOC-3 are 1) wetlands immediately adjacent to the site bordered by Bay Avenue, Bishop Road and a dam on the upstream side, 2) wetlands located between Bishop Road, Sunray Road, Bay Avenue and residences along Thayer Avenue and 3) wetlands between Sunray Road, residences along FM 2725, Gulf Marine Fabricators, Offshore Specialty Fabricators and the outlet of the wetlands into the intracoastal.

There is one active and several abandoned pipelines leading from the refinery to the current and former barge dock facilities. During June 2006, the abandoned pipelines were cut, the contents of the pipelines were removed and plates were welded on the pipeline ends to seal them. These activities were performed under the Remedial Action Work Plan (RAW).

Wetland assessment activities will evaluate releases from the refinery, including any unpermitted wastewater effluent discharges, two known pipeline releases, and possible releases from pipelines leading from the refinery to the current and former barge dock facilities.

There have been documented spills of hydrocarbons, waste and volatile organics. As a

result, the screened COPCs at this AOC included metals, VOCs, SVOCs, PCBs, herbicides and pesticides.

Potentially affected media include sediment, soil, surface water and groundwater.

Reports outlining the VSP-calculated minimum sample sizes with human health or ecological screening values as the benchmarks and using both delta methods are presented as Appendix C: Reports 11 through 14 correspond to AOC-3 surface soils; Reports 15 through 18 correspond to AOC-3 subsurface soils; Reports 19 through 22 correspond to AOC-3 surface water; and Reports 23 through 26 correspond to AOC-3 sediments.

Detailed summary tables of the VSP calculations are presented as Appendix D: Table D-4 corresponds to AOC-3 surface and subsurface soils with human health screening value benchmarks; Table D-5 corresponds to AOC-3 surface and subsurface soils with ecological screening value benchmarks; Table D-6 corresponds to AOC-3 surface water with human health and ecological screening value benchmarks; and Table D-7 corresponds to AOC-3 sediments with human health and ecological screening value benchmarks.

2.2.4 AOC-4 Current Barge Docking Facility

Included in AOC-4 is the current barge docking facility, which is approximately 0.5 acres and is located on the intracoastal waterway. The fenced facility, which is connected to the refinery by pipelines, is used to load and unload barges. At the time of this report only crude oil passed through the docking facility. Historically however, refined products were also loaded and unloaded at this docking facility.

There have been no reported releases nor is there evidence of spills associated with this AOC. The screened COPCs at this AOC included metals, VOCs, SVOCs, PCBs and pesticides/herbicides.

Potentially affected media include soil and groundwater.

Minimum samples size calculations were not performed for composite samples collected during Phase I. The minimum sample quantity necessary for AOC-4 was evaluated using best professional judgment based upon review of site history and analytical results for the composite samples.

2.2.5 AOC-5 Intracoastal Waterway

Included in this AOC are the sediments and surface water adjacent to the current and former barge dock facility. The screened COPCs at this AOC included metals, VOCs, SVOCs, PCBs and pesticides/herbicides.

Potentially affected media include sediment and surface water.

The three Phase I samples for AOC-5 did not qualify for statistical calculation of minimum sample size which requires at least four detected concentrations. The minimum sample quantity necessary for AOC-5 was evaluated by review of Phase I analytical data and best professional judgment.

2.2.6 AOC-6 Thayer Road

Included in this AOC is the neighborhood along Thayer Road, located across Bishop Road from the refinery.

The screened COPCs at this AOC included metals, VOCs, SVOCs, PCBs and pesticides/herbicides.

Potentially affected media include soil and groundwater.

The three Phase I samples for AOC-6 did not qualify for statistical calculation of minimum sample size which requires at least four detected concentrations. The minimum sample quantity necessary for AOC-6 was evaluated by review of Phase I analytical data and best professional judgment.

2.2.7 AOC-7 Bishop Road

Included in this AOC is the neighborhood along Bishop Road, located across Bishop Road from the North site.

The screened COPCs at this AOC included metals, VOCs, SVOCs, PCBs and pesticides/herbicides.

Potentially affected media include soil and groundwater.

The two Phase I samples for AOC-7 did not qualify for statistical calculation of minimum sample size which requires at least four detected concentrations. The minimum sample quantity necessary for AOC-7 was evaluated by review of Phase I analytical data and best professional judgment.

3.0 SAMPLING OBJECTIVES

As stated in the DQOs for this project, the following study question, included in the QAPP, was formulated for the Site RI:

- Where do preliminary COPCs exist either on- or off-site at concentrations above or below risk-based screening levels (RBSLs) and/or background concentrations along complete exposure pathways for relevant exposure scenarios?

The primary objective of the FSP sampling design is to collect data of sufficient quantity and quality to resolve the study question and support risk assessment and remedy evaluation. The field sampling design for Phase II is summarized in Table 3**.**

The goal of Phase II is to determine the nature and extent of COPCs and to identify COPC migration pathways. Data must be of sufficient quality (including acceptable reporting limits) and quantity to perform an ERA and HHRA for the site in accordance with risk assessment guidance (EPA 1991, 1997, 2000d). Additional data will be collected to support an evaluation of presumptive remedies for the site.

The field sampling design for Phase II (Table 3) is divided into activities which may be conducted concurrently:

- On-site random-start systematic grid (random grid) soil sampling to assess potential presence of COPCs of high toxicity and/or high mobility, define the nature and extent of COPCs, characterize waste to allow for disposal option evaluation in the FS, and evaluate whether COPCs are migrating off-site. The data will be used in the HHRA and ERA.
- On-site OU groundwater investigation to determine the nature and extent of groundwater COPCs. Permanent monitor well data will be used in the HHRA and ERA. Data collected during the on-site groundwater investigation will also be used to update the pathway and receptor analysis presented in the CSMs, if necessary.
- Off-site random grid wetlands and intracoastal surface water and sediment investigation to define the nature and extent of COPCs, provide data to be used in the HHRA and ERA and also be used to update the pathway and receptor analysis presented in the CSMs, if necessary.
- Off-site background surface soil, subsurface soil, groundwater, surface water and sediment investigation to provide data to be used in the HHRA and ERA.

The strategy for characterizing the site is based on site-specific DQOs, which are based on the following media-specific screening levels (MSSLs):

- EPA Region 6 human health MSSLs and TCEQ Tier 1 PCLs for human health risk screening of soil and groundwater. Groundwater ingestion pathways will only apply, upon consultation with the EPA and TCEQ, if the shallow aquifer is of sufficient yield and natural quality to constitute a potable water supply. Soil screening levels (assuming the dilution/attenuation factor of 10 as suggested by the EPA Soil Screening Level guidance document) will be used to evaluate soil-to-groundwater migration potential;

- TCEQ ecological benchmarks for ecological screening of soil, sediment and surface water;

- Texas and Federal Surface Water Quality Criteria for human health screening; and,

- Other applicable or relevant and appropriate requirements (ARARs).

A complete list of all human health and ecological screening levels (benchmarks) are provided as Appendices E and F of the FSP.

Each of the field sampling activities and the data collection requirements are discussed in the following sections.

3.1 On-Site Random Start Grid Locations AOC-1

A total of 24 random start grid sample locations (four from the North site and 20 from the South site) will be used to assess areas suspected of having had an historical release and discolored areas within former OUs (Figure 3). This area has been designated as AOC-1. The basis of decision for the proposed number of additional soil samples within AOC-1 is summarized in Table 2 with details presented as Appendix D, Tables D-1 and D-2.

There are four random start grid locations (G2-01S – G2-04S) at the North site to characterize possible COPCs in the soil as a result of releases from product storage, pipelines, the former oil and fuel storage racks, storm water run-off, the adjoining Plains site and a former surface impoundment.

There are 20 random start grid sampling locations (G2-05S – G2-24S) at the South site to characterize possible COPCs in the soil as a result of releases from product storage, pipelines, drums, debris, storm water run-off, an aeration pond and stained soil.

Due to the shallow depth of the groundwater, which was less than eight feet, two soil samples will be obtained for laboratory analysis from each boring. Samples will be obtained from the surface to 0.5 feet bgs and from the interval with the highest photoionization detector (PID) reading. In the event of no PID readings, a soil sample from

the groundwater interface or at a depth of five feet will be obtained. Samples will be analyzed in a fixed laboratory for Phase I COPCs as shown in Table 3. Each boring will be advanced a minimum of five feet below the initial contact with groundwater.

3.2 On-Site Random Grid Locations AOC-2

The sampling objectives for non-OU on-site soil sampling include determining the nature and extent of COPCs and collecting sufficient data of appropriate quality to assess site risks to either human or ecological populations.

During Phase I, composite sampling was performed and only arsenic was detected above the appropriate screening level. Several constituents were analyzed below the MDL. However, the MDL exceeded screening criteria.

There are four random start grid sampling locations (Figure 4) at AOC-2 (G2-25S through G2-28S) selected by the VSP. The basis of decision for the proposed number of additional soil samples within AOC-2 is summarized in Table 2. AOC-2 is comprised of non-OU areas of the site having no history of releases. Samples will be obtained from the surface to 0.5 feet bgs and from the interval with the highest photoionization detector (PID) reading. In the event of no PID readings, a soil sample from the groundwater interface or at a depth of five feet will be obtained. Discrete surface and subsurface samples will be obtained from two sample locations and will be analyzed in a fixed laboratory for Phase I COPCs as shown in Table 3.

3.3 On-Site Random Grid Locations AOC-4

The sampling objectives for AOC-4 on-site soil sampling include determining the nature and extent of COPCs and collecting sufficient data of appropriate quality to assess site risks to either human or ecological populations.

Similar to AOC-2, composite sampling was performed at AOC-4. Sampling results indicated several COPCs detected above screening criteria. For Phase II, five random start grid sampling locations (Figure 5) have been selected at AOC-4 (G2-29S – G2-33S). The basis of decision for the proposed number of additional soil samples within AOC-4 is summarized in Table 2. Samples will be obtained from the surface to 0.5 feet bgs and from the interval with the highest photoionization detector (PID) reading. In the event of no PID readings, a soil sample from the groundwater interface or at a depth of five feet will be obtained. Discrete surface and subsurface samples will be obtained from five sample locations and will be analyzed in a fixed laboratory for Phase I COPCs as shown in Table 3.

3.4 On-Site Groundwater Locations

The objectives of the on-site groundwater investigation are to determine whether site activities have impacted the shallow aquifer or deeper aquifers and to characterize basic hydrogeology of the site. Groundwater sampling during the Phase II investigation will be accomplished with permanent monitor wells at seven locations.

Locations for the permanent monitor wells (Figure 2) were selected by VSP using a random start grid pattern, which includes two at the North site (MW01-01 – MW01-02) and five at the South site (MW01-03 – MW01-07). The basis of decision for the proposed number of additional groundwater samples within AOC-1 is summarized in Table 2 with details presented as Appendix D, Table D-3. Groundwater samples will be analyzed in a fixed laboratory for Phase I COPCs as shown in Table 3. The groundwater data will be used to evaluate human health risk via the groundwater pathway and may be used to evaluate ecological risk through groundwater discharging to surface water. Monitor well installation, surveying and groundwater sampling will be conducted in accordance with the protocols discussed in Appendix A of the FSP.

3.5 Off-Site Random Grid Sediment Locations AOC-3

The sampling objectives for off-site sediment sampling include determining the nature and extent of contamination and collecting sufficient data of appropriate quality to assess site risks to either human or ecological populations.

The six random start grid sampling locations (G2-01SD - G2-06SD) were selected utilizing VSP (Figure 6). The basis of decision for the proposed number of additional sediment samples within AOC-3 is summarized in Table 2 with details presented as Appendix D, Table D-7. Analysis of Phase I results indicated no additional sediment sampling was necessary; however, six locations have been selected to confirm Phase I results and to again attempt to achieve MDLs lower than screening criteria.

Samples will be obtained from sediment, or soils if random wetland locations are not inundated, from the 0.0 to 0.5 foot interval and will be analyzed in a fixed laboratory for Phase I COPCs as shown in Table 3.

3.6 Off-Site Random Grid Locations AOC-5

The sampling objectives for off-site sediment sampling include determining the nature and extent of COPCs and collecting sufficient data of appropriate quality to assess site risks to either human or ecological populations.

Due to several detections above screening criteria, seven random start grid sampling locations (G2-07SD - G2-13SD) were selected utilizing VSP (Figure 7). These additional samples will be combined with the three results from Phase I sampling for a total of 10 samples to improve the strength of statistical analysis. The basis of decision for the proposed number of additional sediment samples within AOC-5 is presented in Table 2.

Samples will be obtained from the sediment from the 0.0 to 0.5 foot interval and will be analyzed in a fixed laboratory for Phase I COPCs as shown in Table 3.

3.7 Off-Site Surface Water Samples AOC-3

Surface water samples will be obtained from 16 locations within AOC-3 (G2-01SW - G2-16SW) and analyzed for metals, VOCs, SVOCs, PCBs and pesticides/herbicides. Specific sampling locations will be selected based on surface water conditions at the time of sampling. The basis of decision for the proposed number of additional surface water samples within AOC-3 is summarized in Table 2 with details presented as Appendix D, Table D-6.

The wetlands adjacent to the site are frequently dry and change configuration. Prior to sampling, the surface water area within AOC-3 will be mapped and VSP will be used to select 16 random start grid locations. The RPM will be notified of the selected sampling locations.

Surface water sampling for ecological assessment purposes will be in accordance with TCEQ's guidance document entitled (*Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods; RG-415*). The sampling protocol has been incorporated into SOP 21, which is provided in Appendix E.

4.0 FIELD INVESTIGATION

This section describes the field investigation activities to be performed during Phase II of the RI at the site, including the rationale for the various field activities and the number of samples to be collected.

Samples will be analyzed by Accutest Laboratories using appropriate analytical methods for the isolation, detection, and quantification of specific target compounds and analytes. The applicable analytical methods (e.g., EPA SW-846 or equivalent) are referenced in the FSP and QAPP.

4.1 Utility Clearance and Site Reconnaissance

The initial site reconnaissance and characterization will be performed in accordance with Kleinfelder's standard operating procedure (SOP) No.1.0. The site reconnaissance and characterization will include site and utilities identification, and a topographic survey, including easements, site surface features, and rights-of-way.

4.2 Geologic Investigation

The soil investigation includes an evaluation of surface and subsurface soils with regard to the nature and extent of COPCs. On-site random grid sample locations are shown on Figures 3, 4 and 5. Field sample locations are subject to field verification, and may be adjusted due to utilities, accessibility, etc.

All soil data determined to be usable for risk assessment will also be used in the HHRA and ERA. The on-site Phase II investigation includes the evaluation of soil and groundwater from the surface to the shallow aquifer, at a depth of approximately 12 feet bgs.

4.2.1 On-Site Surface Soil Sampling

Surface soils refer to those soils from the ground surface to 0.5 feet bgs. To characterize soil at all locations (including planned sample locations presently below concrete or asphalt), and to ensure samples may be used to characterize future on-site risks assuming present ground cover will change, underlying soil will be accessed through 6-inch-diameter core holes, where necessary, to access soils beneath concrete or asphalt.

Surface soil will be collected with either a (1) drive sampler device lined with acetate sleeves using Geoprobe equipment or (2) hand sampling device, such as a soil hand auger or manual drive sampler.

Soil samples for nature and extent of COPCs will be collected from depths determined in the field, based on lithologic characteristics and field-screening techniques. In some AOCs, nature and extent will be evaluated by both grid and judgmental boring locations.

4.2.2 On-Site Random Grid Surface Soil Samples

The surface soil sampling interval will be 0.0 to 0.5 foot bgs. Samples will be field-screened with a photoionization detector (PID).

On-site random grid surface soil samples will be obtained at AOC-1, AOC-2, and AOC-4, properly stored, and subsequently analyzed at a fixed laboratory.

4.2.3 On-Site Random Grid Subsurface Soil Sampling

Subsurface soils refer to those soils from depths greater than 0.5 feet bgs. Subsurface soil samples will be collected with a drive sampler lined with acetate sleeves using Geoprobe equipment.

Subsurface soil samples will undergo the same sample preparation procedures outlined for surface soil samples.

Lithologic core samples will be collected to evaluate surface and subsurface soil conditions as well as profile the unsaturated zone.

Samples will be field-screened with selected samples submitted to the fixed laboratory for analysis of COPCs as noted in Table 3.

4.3 On-Site Groundwater Sampling

During Phase II, seven locations will be selected for installation of permanent monitor wells within AOC-1. These wells will be installed immediately following soil sample collection, and properly developed.

Post-development groundwater samples collected from permanent monitoring wells will not be filtered when analyzed for VOCs and SVOCs. Groundwater collected for metals analysis will be split into filtered and unfiltered samples to permit identification of ratios of dissolved and suspended metal concentrations. Use of these ratios for site management or risk assessment purposes will be subject to prior review and approval of EPA. Groundwater will be analyzed for COPCs as indicated in Table 3.

Depending on the preliminary COPCs present and the magnitude of concentrations detected in the shallowest aquifer, additional investigation to the next deeper aquifer (for vertical nature and extent) may or may not be indicated. Specifically, the detection of

naturally occurring metals in the shallowest aquifer is to be expected. Therefore further assessment of the next deeper aquifer may not be indicated based on comparison to background concentrations and the presence of significant concentrations relative to appropriate screening levels (based on unit classification) are detected in permanent monitoring wells.

Further assessment of groundwater contaminants may require a second mobilization during Phase II. Installation of monitor wells to a deeper aquifer would also take place during a subsequent mobilization.

If the shallow aquifer is impacted by site-related COPCs, the underlying water-bearing zones (WBZs) may need evaluation to determine the nature and extent of COPCs if (1) hydrogeological connections are suspected and (2) the contaminant fate and transport characteristics indicate a potential for downward migration. The investigation and sampling needs for the deeper WBZs will be discussed with EPA after evaluation of the Phase II shallow aquifer data.

4.4 Off-Site Sampling

Off-site field activities will include the following:

- Obtaining access agreements;
- Sampling sediment in the wetlands and bay adjacent to the site;
- Sampling soil in residential areas; and
- Sampling at background locations.

Each off-site sampling activity is discussed in the following sections. The sampling intervals and analytical suites at each off-site sampling location are summarized in Table 3.

4.4.1 Background Sampling

The preliminary COPCs at the site are inorganic and organic contaminants, which may be both (1) naturally occurring in geologic formations and (2) anthropogenic (man-made) contaminants resulting from the site and from adjacent facilities.

Background sampling has three goals, including providing data for (1) comparison of COPCs in surficial soils; (2) establishing attribution, via establishing either the absence or low-level (naturally occurring) concentrations of indicator or signature inorganic constituents, which may have been released from the site; and (3) establishing site-specific background concentrations for application to both the off-site and on-site soil investigation.

To assist identification of background sampling locations with a minimum likelihood of impact from former operations at the site and from surrounding industry, the Corpus Christi Wind Rose from January 1984 through December 31, 1992 is provided as Figure 8. Review of the wind rose data indicate the predominant wind direction at the site is from the southeast. As a result, background sampling locations to the southwest and northeast of the site will be preferentially selected.

Provided as Figure 9, is a wetland distribution map from the National Wetland Inventory of the site. Review of the figure shows the wetlands immediately to the east of the refinery are depicted as palustrine, emergent, persistent, seasonally flooded and excavated. Due to the manmade influence on this habitat, background sampling will not include this habitat.

The adjoining wetlands are classified under two habitats: 1) as estuarine, intertidal, emergent, persistent and irregularly flooded and 2) estuarine, intertidal, unconsolidated shore and regularly flooded. Background wetland sediment sampling will be in these two habitats.

AOC-5, the intracoastal way Bay, is a different aquatic environment from the wetland areas adjoining the site. As such, background concentrations of COPCs may be different in the wetland sediments compared to the intracoastal sediments. Background sample data from the intracoastal will be evaluated separately from the wetland background sample data.

During Phase I, four background locations were selected for each media of concern. During Phase II, additional locations will be sampled (Figure 10).

To meet these goals, six surface soil, six subsurface soil, six groundwater, six sediment wetland, six sediment intercoastal and six surface water background samples, as noted in Table 3 and shown on Figure 10, will be collected from areas identified as unlikely to be impacted by site operations. The areas were selected based on similar soil, sediment, and surface water types to AOC soil, sediment, and surface water.

At each of the locations, a sample will be collected and analyzed for the preliminary COPCs noted in Table 3.

4.4.2 Off-Site Sediment and Surface Water Sampling

The RI will include an investigation of sediment and surface water in adjacent wetlands (AOC-3) and in the intracoastal waterway (AOC-5). Wetland sediment/soil sampling locations will be identified using random start grid locations identified using VSP. The basis of decision for the proposed number of additional surface water samples in AOC-3 and AOC-5 is presented in Table 2.

The sediment samples from the intracoastal waterway will be random start grid locations to determine if there are COPCs associated with the current and historic barge dock facilities and the culvert draining into the intracoastal waterway.

At each sampling point, a conscious effort will be made to sample surface water without disturbing sediment (and in sequence with surface water collected prior to sediment collection). The surface water samples will be collected using a coliwasa, long-handled dipper, or submerged sample jar. All surface water samples collected for VOC analysis will be placed in sample containers with zero headspace. No stratification of the dissolved phase surface water is expected, based on the preliminary class of COPCs and the depths of the ponds. Therefore sampling from the most accessible surface meets the DQOs for the vertical boundaries of the on-site surface waters.

For Phase II at least five surface water samples will be split into filtered and unfiltered samples and analyzed as appropriate. Data from analysis of these split samples will be evaluated to identify ratios of dissolved to unfiltered concentrations. Use of these ratios for site management or risk assessment purposes will be subject to prior review and approval of EPA.

Sediment samples will be collected from the top 0.5 feet using a hand core sampler driven with a slide hammer, long-handled dipper, or other suitable sampling device as site-specific conditions warrant.

Sediments will be analyzed for preliminary COPCs as outlined in Table 3.

5.0 SAMPLE DESIGNATIONS

Each sample obtained in the field will be designated with a unique alphanumeric designation according to the following sample classifications.

5.1 Grid Sample Designation

Geoprobe surface and subsurface soil samples will be collected at grid nodes in AOC-1, AOC-2 and AOC-4. Random sediment samples will be obtained from AOC-3 and AOC-5. The grid sample designation will include three fields separated by dashes. For example: G2-01S-4.0-4.5.

- The first field, "G2-01S" identifies the grid sample number within Phase II. The alpha character is the designation for grid sample (G). The following numerical characters are the distinct number for the random grid sample location. The following alpha characters indicate the sample is a soil sample (S). If the sample is a sediment sample the designation SD will be used.

- The second field, "4.0" represents the top of the sample interval measured in feet bgs.

- The third field, "4.5" represents the bottom of the sample interval measured in feet bgs.

5.2 Groundwater Sample Designation

Groundwater sample designations will include separate nomenclature for samples collected from temporary monitoring wells and permanent monitoring wells.

Permanent monitor well (MW) groundwater sample designations will include two fields separated by a dash. For example: MW01-05.

- The two alpha characters in the first field, "MW01" identify the sample as having been collected from a permanent monitoring well and "01" identifies the AOC.

- The second field, "05," represents the numerical designation for the permanent monitor well number.

If necessary to sample deeper aquifers during Phase II operations, an additional field will be added to the sample designations to show which aquifer is being assessed.

5.3 Surface Water Sample Designation

Surface water samples will be collected from wetlands and the intracoastal waterway. The surface water sample designation will include two fields separated by a dash. For example: SW-01. The two alpha characters in the first field, "SW" identify the sample as a surface water (SW) sample. The second field, "01" represents the numerical designation of the surface water sample.

5.4 Background Soil Sample Designation

Field background samples will be identified by "BG" followed by a sequential number. The background sample designation includes three fields separated by a dash. For example: BG-01S-0.0-0.5.

- The first field, "BG" identifies the sample as a background (BG) sample followed by "01" which represents the numerical designation of the sample. The following alpha characters indicate the sample is a soil sample (S). If the sample is a sediment sample the designation SD will be used.

- The second field, "0.0" represents the top of the sample interval measured in feet bgs.

- The third field, "0.5" represents the bottom of the sample interval measured in feet bgs.

5.5 Background Groundwater Sample Designation

Groundwater background samples will be collected from temporary monitor wells (TW). The background groundwater samples designation will include two fields separated by a dash. For example: TWBG-10.

- The alpha characters in the first field, "TWBG" identify the sample as having been collected from a temporary monitoring well and "BG" identifies the sample as a background sample.

- The second field, "10," represents the numerical designation for the temporary monitor well.

5.6 Background Surface Water Sample Designation

Background surface water samples will be collected from wetlands. The background surface water designation will include two fields separated by a dash. For example: BG-20SW. The alpha characters in the first field, "BG" identify the sample as a

background sample. The numeric characters in the second field, "20" represent the numerical designation for the sample, followed by the alpha characters "SW", indicating the sample as a surface water sample.

5.7 Field Duplicate Sample Designation

Field duplicate samples will be identified by adding a "D" to the end of the sample designations described above. For example, TW01-05D or MW01-05D and J-03S-0.0-0.5D.

5.8 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Sample Designation (for organic analyses)

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) organic samples will be identified by adding an "MSD" to the end of the sample designations described above, for example: MW01-05MSD and J-03S-0.0-0.5MSD.

5.9 Matrix Spike/Matrix Duplicate (MS/MD) Sample Designation (for inorganic analyses)

MS and Matrix Duplicate (MD) inorganic samples will be identified by adding an "MD" to the end of the sample designations described above. For example: MW01-05MD and J-03S-0.0-0.5MD.

5.10 Trip and Equipment Blank Sample Designation

Trip and equipment blank samples will be identified sequentially beginning with TB-1 and EB-1, respectively.

6.0 SAMPLING EQUIPMENT AND PROCEDURES

This section is described in detail in the approved FSP dated August 24, 2008.

7.0 SCHEDULE

The following brief project schedule is planned:

- Phase II Field Investigations: July 2009 through August 2009
- Data Analysis: Phase II July 2009 through October 2009
- Draft Preliminary Site Characterization Summary Report: November 2009
- Draft Baseline Human Health Risk Assessment: May 2010
- Draft Screening Level Ecological Risk Assessment: May 2010
- Draft Remedial Investigation Report: May 2010
- Draft Feasibility Study Report: November 2010

A detailed schedule of all activities is available in the RI/FS Work Plan.

KLEINFELDER
Bright People. Right Solutions.

FIGURES

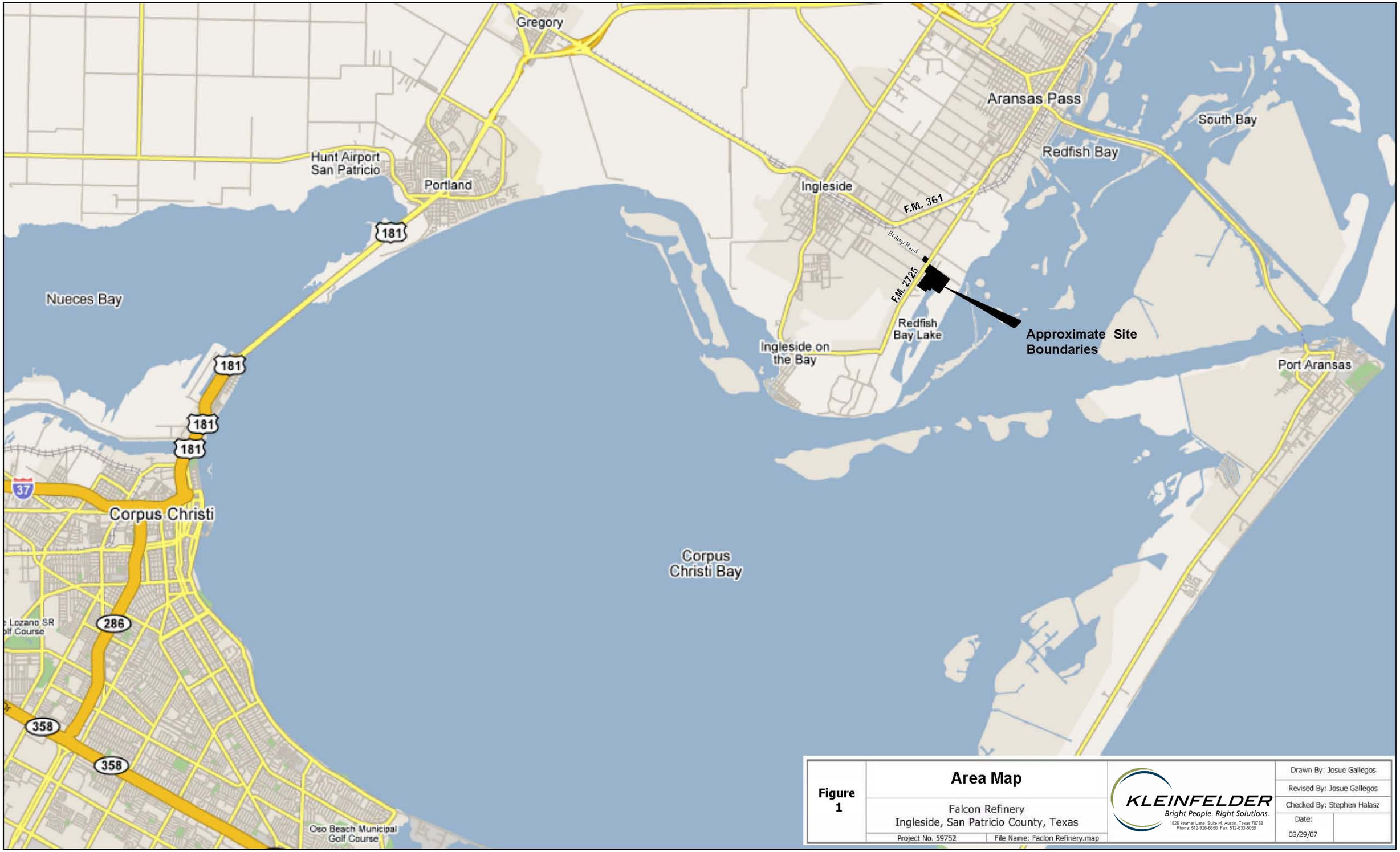
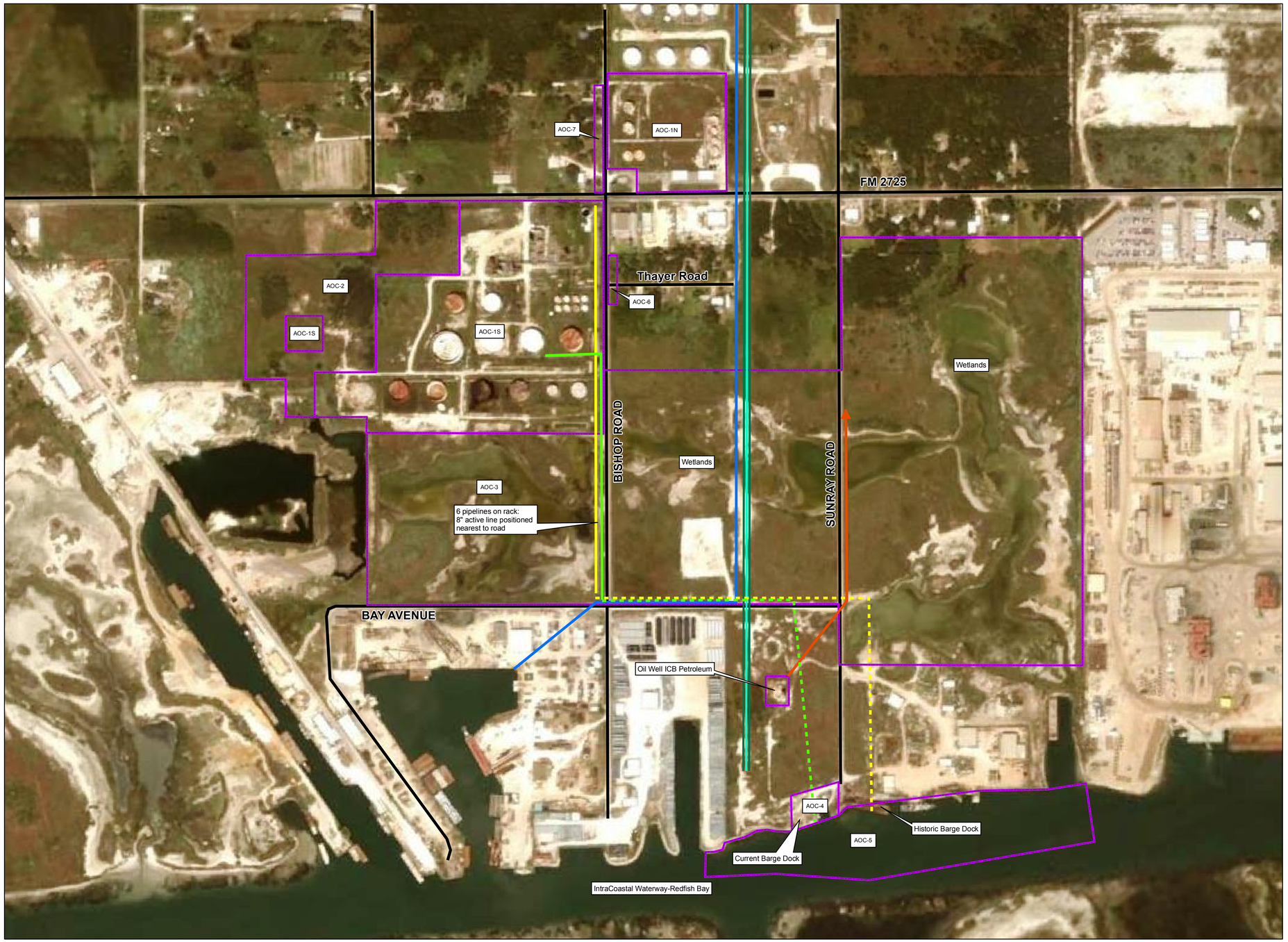


Figure 1	**Area Map** Falcon Refinery Ingleside, San Patricio County, Texas Project No. 59752 | File Name: Faclon Refinery.map	KLEINFELDER *Bright People. Right Solutions.* 1826 Kramer Lane, Suite M, Austin, Texas 78758 Phone: 512-926-6650 Fax: 512-833-5098	Drawn By: Josue Gallegos Revised By: Josue Gallegos Checked By: Stephen Halasz Date: 03/29/07



Legend

Active NORCO Pipeline
- Above Ground
- Underground

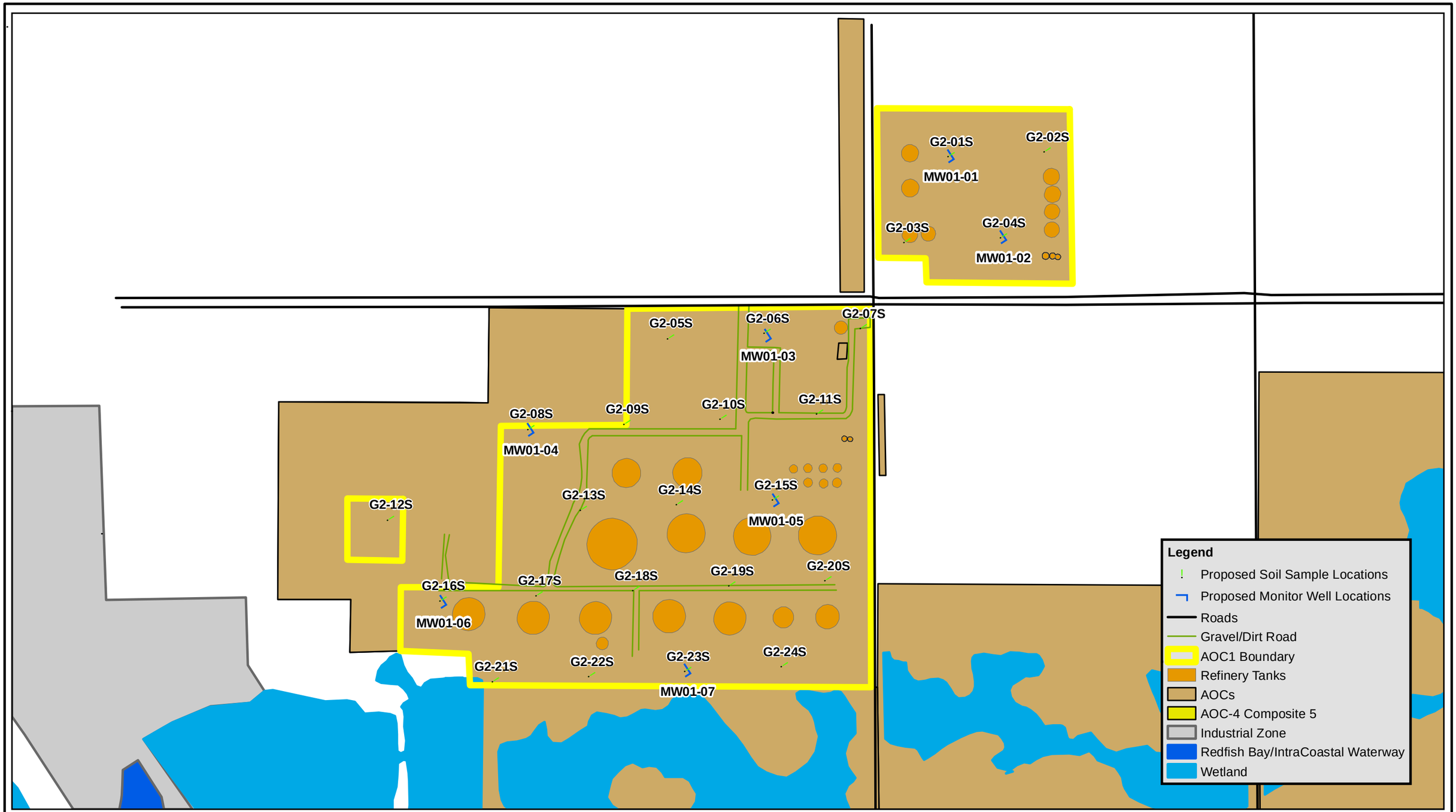
Abandoned NORCO Pipeline
- Above Ground
- Underground

Outside Operations
- Gulf South Pipeline
- Boss Pipeline
- Gathering Line 2'
- Plains Marketing Pipeline

- Area of Concern (AOC)
- Roads

0 150 300 600 Feet

Figure 2	**AREA OF CONCERN MAP** Falcon Refinery Ingleside, San Patricio County, Texas	KLEINFELDER *Bright People. Right Solutions.* 1826 Kramer Lane, Suite M, Austin, Texas 78758 Phone: 512-926-6650 Fax: 512-833-5058	Drawn By: MAEA Revised By: WITT Checked By:
	Project No. 59752 / Filename: Falcon Refinery w/ Photo. mxd		Date: 4/1/2009



DATE DRAWN: 4/1/09	DATE REVISED: 5/21/09
DRAFTED BY: C. SEATON	
CHECKED BY: S. HALASZ	
APPROVED BY:	

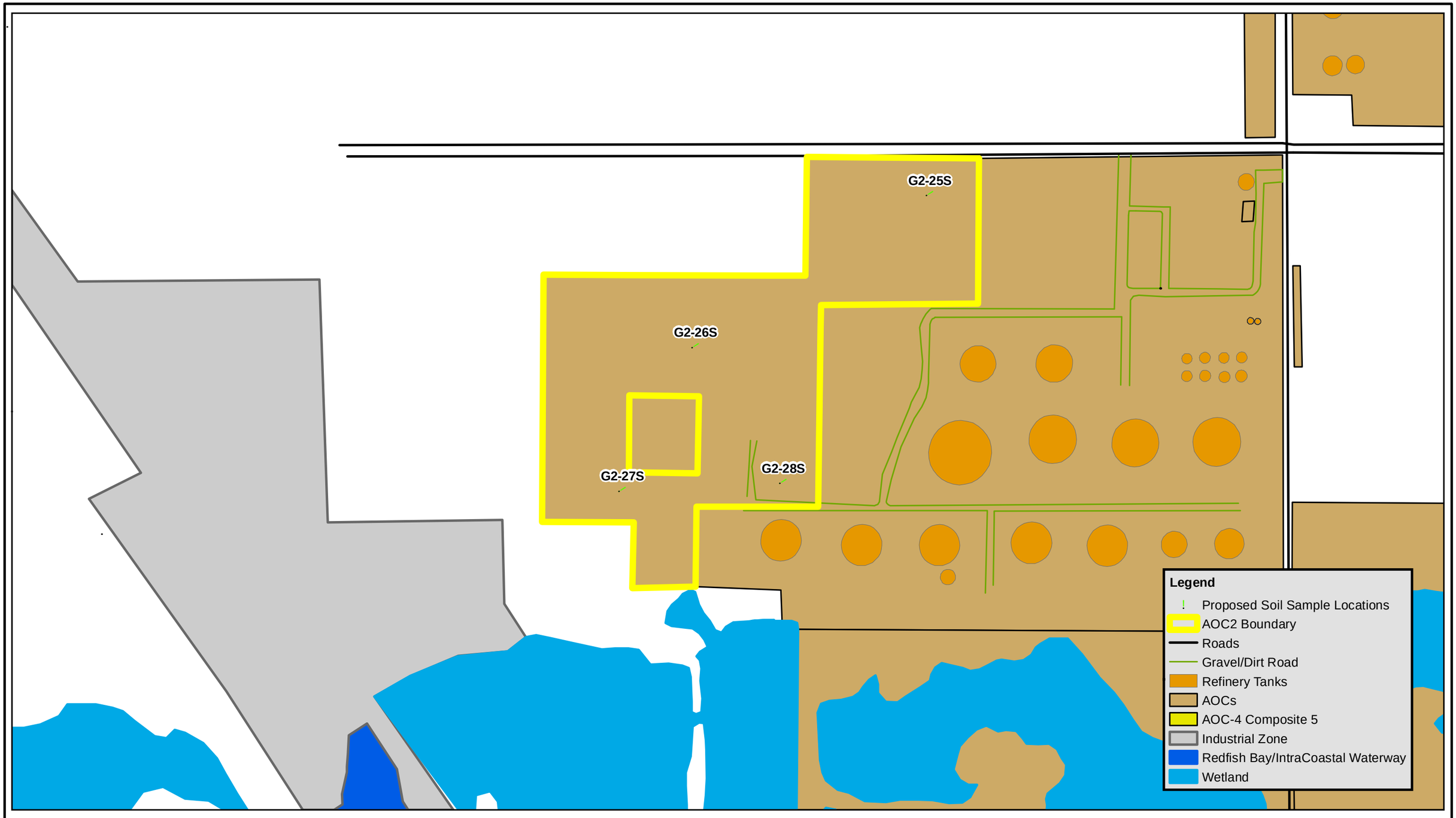
AOC1
Proposed Sample Locations

FALCON REFINERY
INGLESIDE, SAN PATRICIO COUNTY, TEXAS

PROJ NO. 59752 | FILE NAME: Falcon Refinery Base Map

KLEINFELDER
Bright People. Right Solutions.
1826 Kramer Lane, Suite M, Austin, TX 78758
Phone: 512-926-6650 Fax: 512-833-5058
www.kleinfelder.com

FIGURE
3



0 400 800

Feet

DATE DRAWN: 4/1/09	DATE REVISED: 5/21/09
DRAFTED BY:	C. SEATON
CHECKED BY:	S. HALASZ
APPROVED BY:	

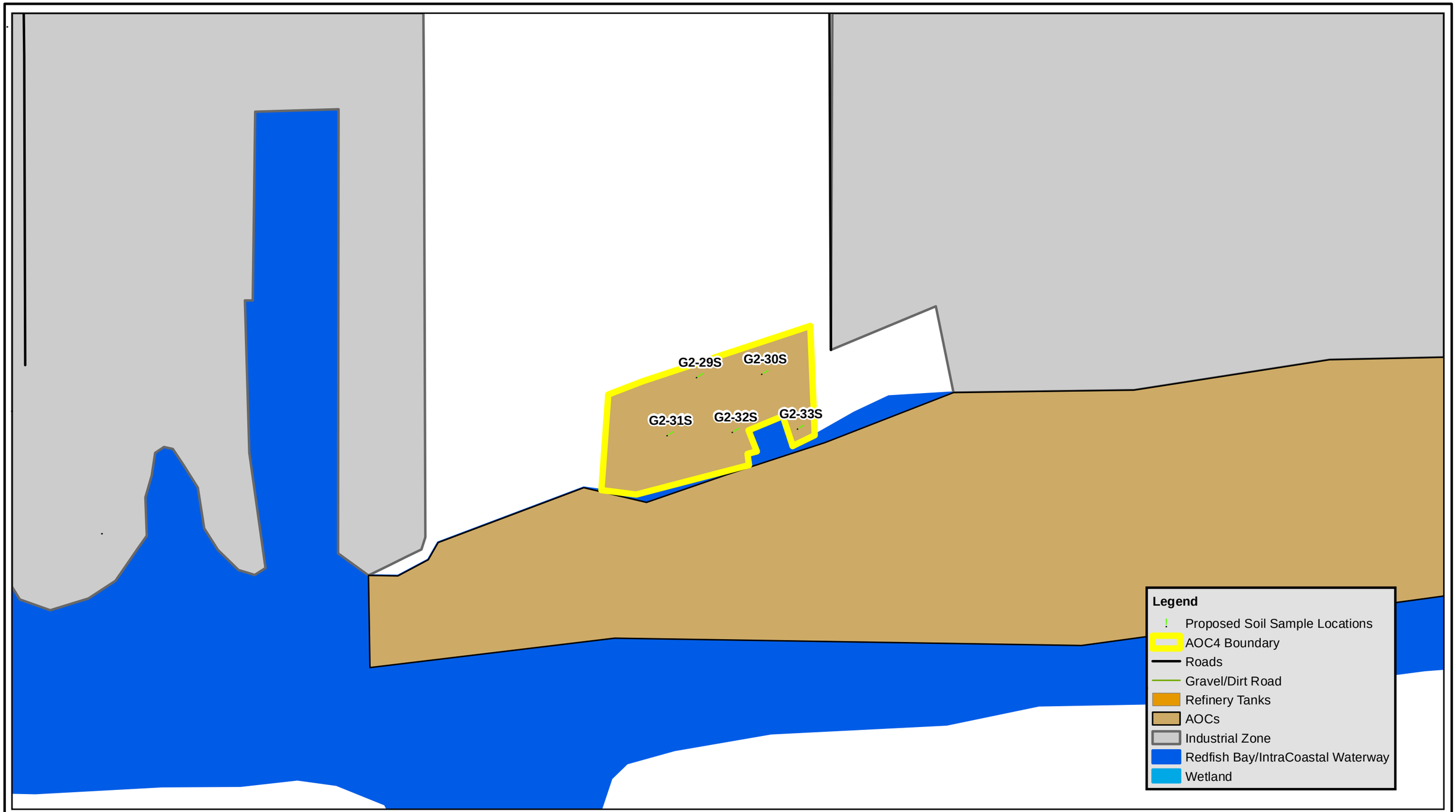
AOC2
Proposed Sample Locations

FALCON REFINERY
INGLESIDE, SAN PATRICIO COUNTY, TEXAS

PROJ NO. 59752 FILE NAME: Falcon Refinery Base Map

KLEINFELDER
Bright People. Right Solutions.
1826 Kramer Lane, Suite M, Austin, TX 78758
Phone: 512-926-6650 Fax: 512-833-5058
www.kleinfelder.com

FIGURE
4



1"

0 250 500

Feet

DATE DRAWN: 4/1/09	DATE REVISED: 5/21/09
DRAFTED BY:	C. SEATON
CHECKED BY:	S. HALASZ
APPROVED BY:	

AOC4
Proposed Sample Locations

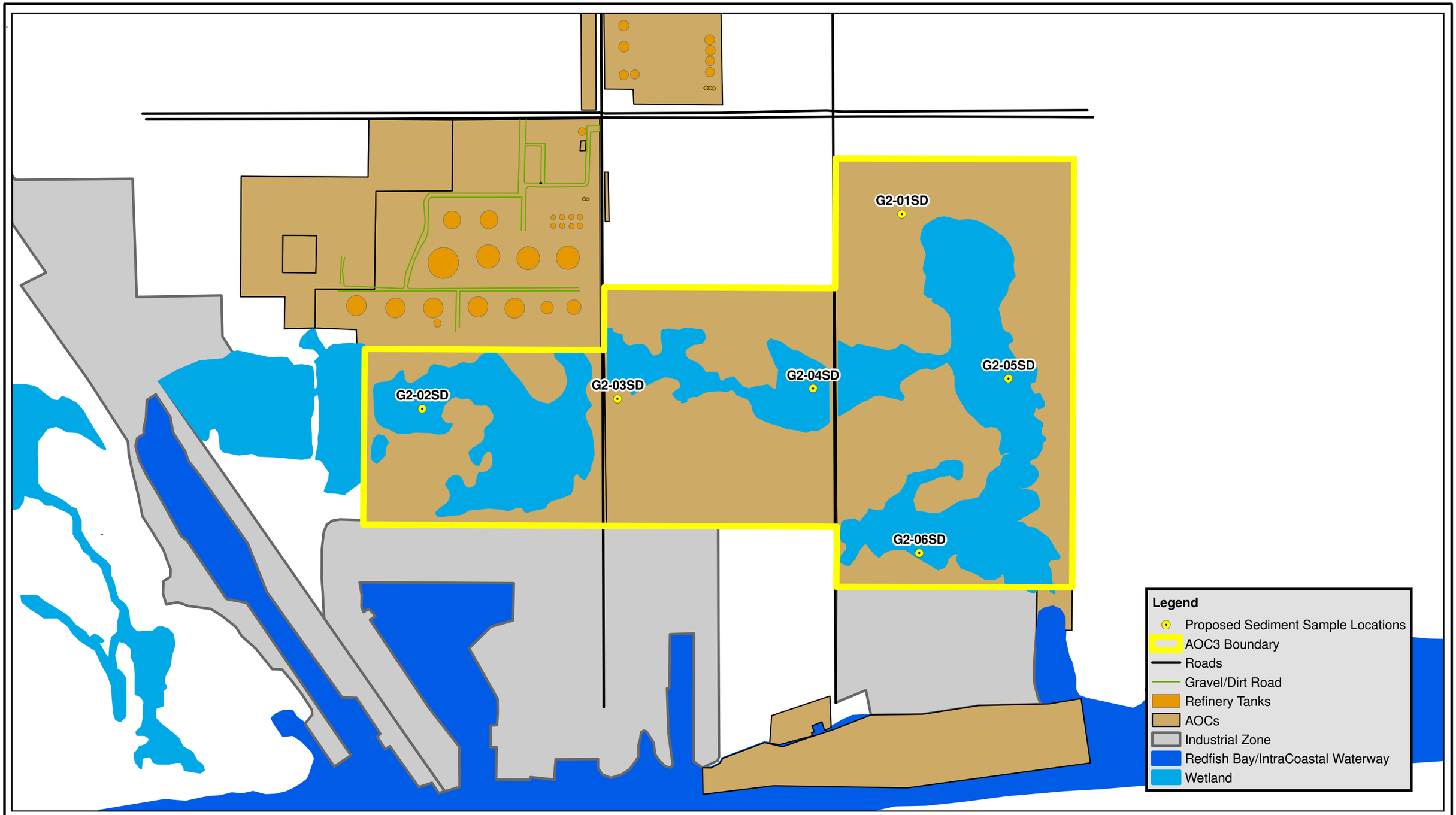
FALCON REFINERY
INGLESIDE, SAN PATRICIO COUNTY, TEXAS

PROJ NO. 59752 FILE NAME: Falcon Refinery Base Map

KLEINFELDER
Bright People. Right Solutions.
1826 Kramer Lane, Suite M, Austin, TX 78758
Phone: 512-926-6650 Fax: 512-833-5058
www.kleinfelder.com

FIGURE

5



0 940 1,880

Feet

DATE DRAWN: 4/1/09	DATE REVISED:
DRAFTED BY:	C. SEATON
CHECKED BY:	S. HALASZ
APPROVED BY:	

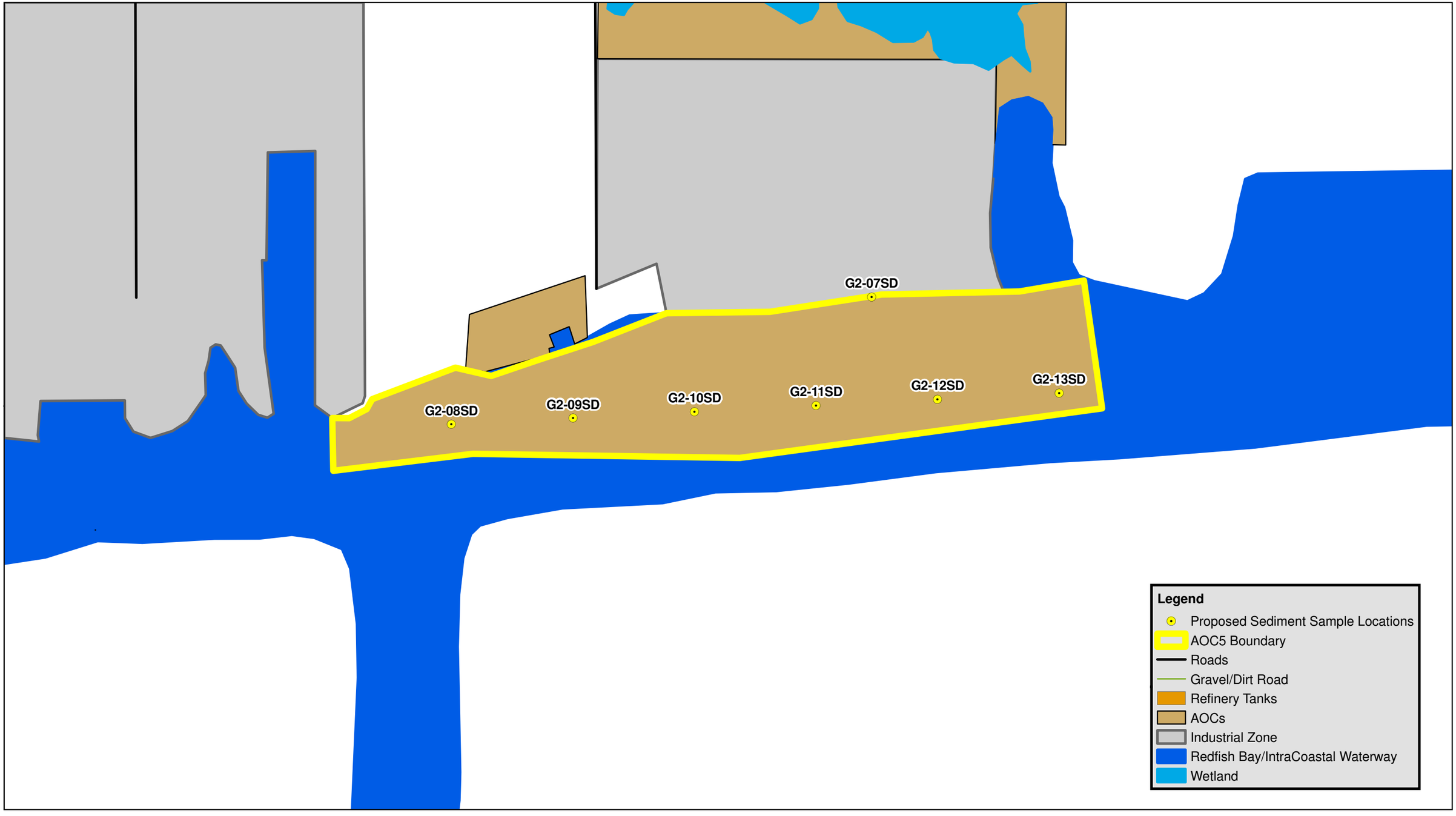
AOC3
Proposed Sample Locations

FALCON REFINERY
INGLESIDE, SAN PATRICIO COUNTY, TEXAS

PROJ NO. 59752 FILE NAME: Falcon Refinery Base Map

KLEINFELDER
Bright People. Right Solutions.
1826 Kramer Lane, Suite M, Austin, TX 78758
Phone: 512-926-6650 Fax: 512-833-5058
www.kleinfelder.com

FIGURE
6



N

0 400 800

Feet

DATE DRAWN: 4/1/09	DATE REVISED:
DRAFTED BY: C. SEATON	
CHECKED BY: S. HALASZ	
APPROVED BY:	

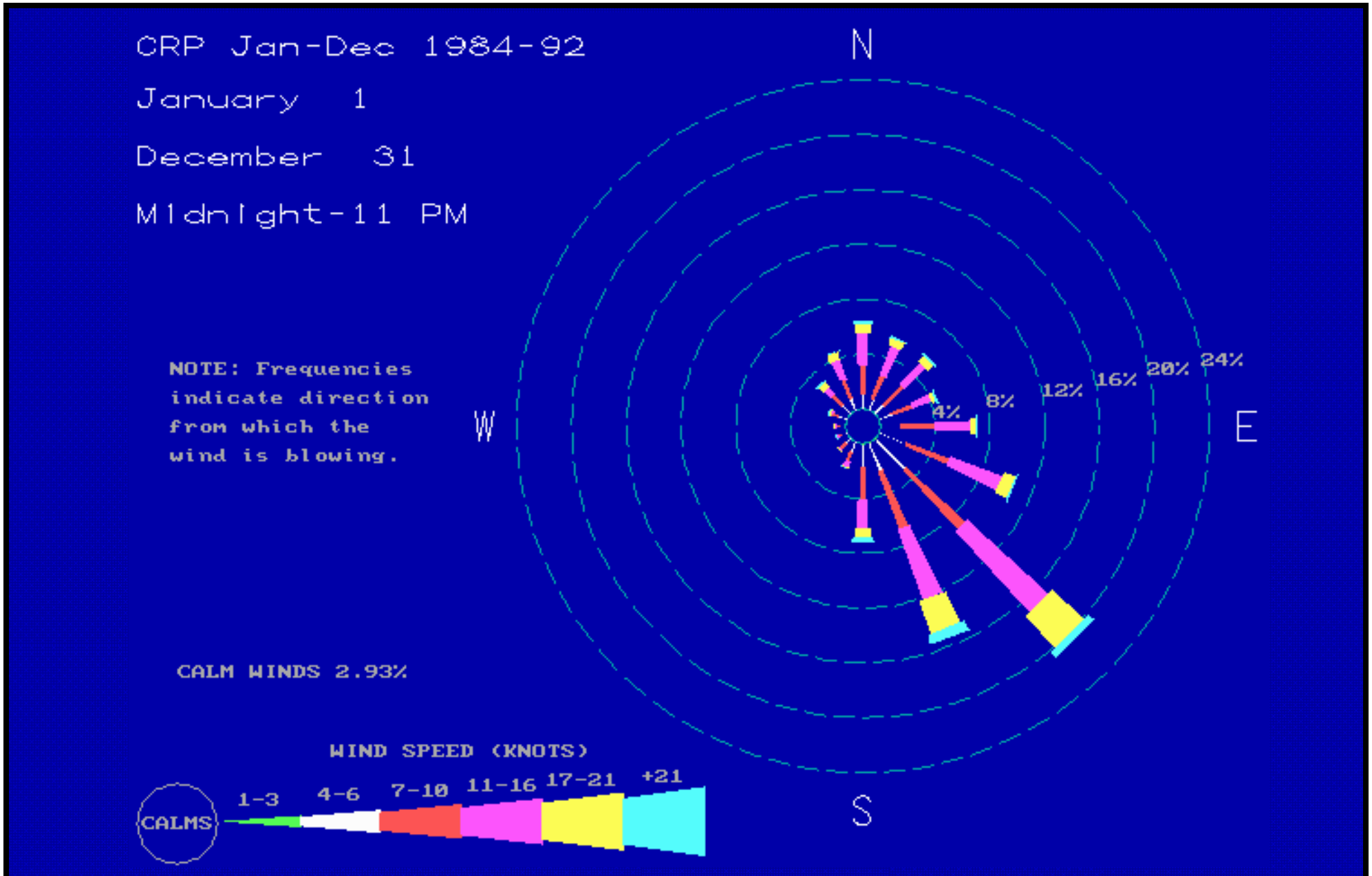
AOC5
Proposed Sample Locations

FALCON REFINERY
INGLESIDE, SAN PATRICIO COUNTY, TEXAS

PROJ NO. 59752 | FILE NAME: Falcon Refinery Base Map

KLEINFELDER
Bright People. Right Solutions.
1826 Kramer Lane, Suite M, Austin, TX 78758
Phone: 512-926-6650 Fax: 512-833-5058
www.kleinfelder.com

FIGURE
7



KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

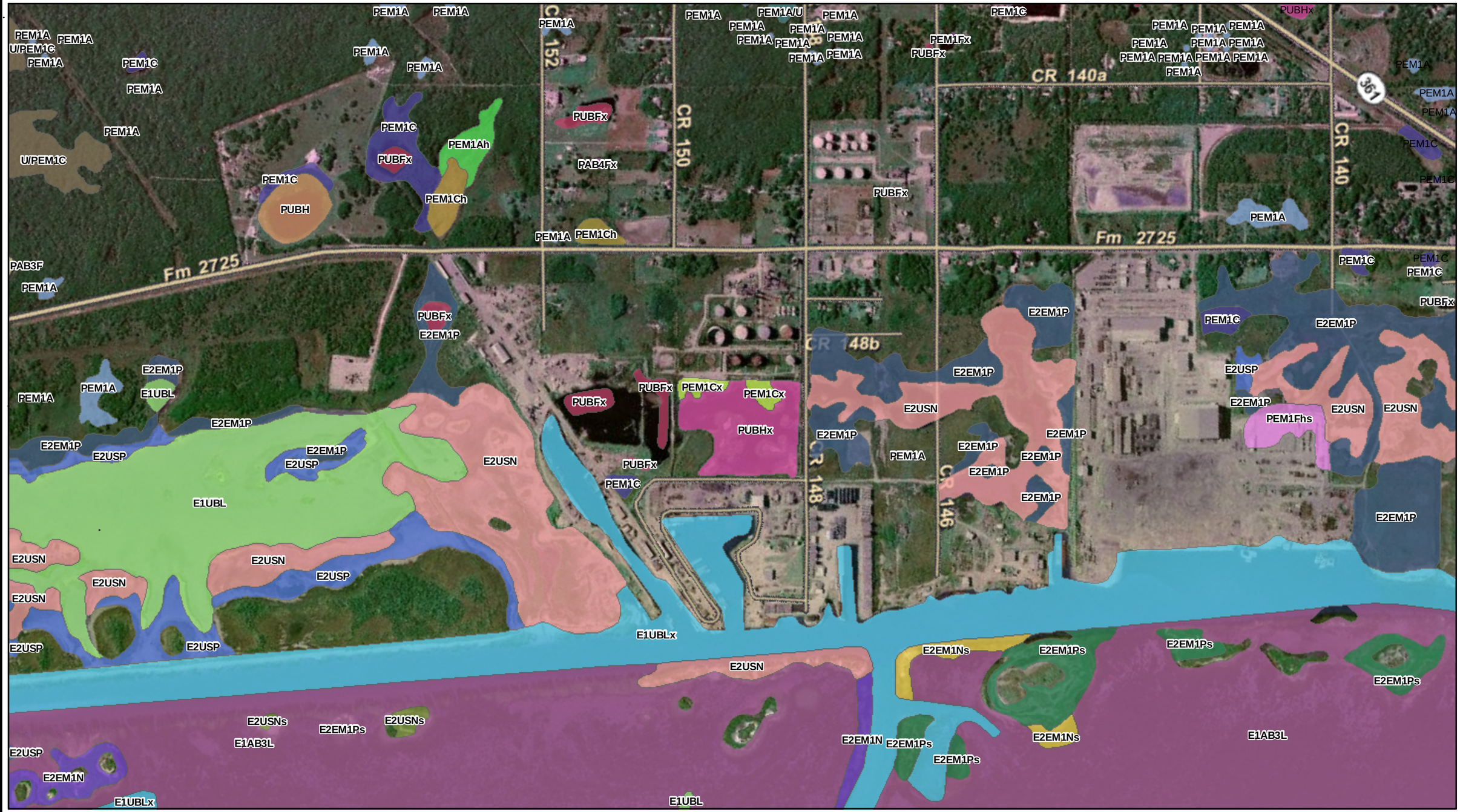
PROJECT NO.	59752
DRAWN:	May 2009
DRAWN BY:	C. Seaton
CHECKED BY:	S. Halasz
FILE NAME:	G:/Environ/Falcon/FSP/Figures

CORPUS CHRISTI WIND ROSE

Falcon Refinery
Ingleside, San Patricio County, Texas

FIGURE

8



0 375 750 1,500 2,250 3,000

Feet

DATE DRAWN: 05/09	DATE REVISED:
DRAFTED BY:	C. SEATON
CHECKED BY:	S. HALASZ
APPROVED BY:	

National Wetland Inventory Map

FALCON REFINERY
INGLESIDE, SAN PATRICIO COUNTY, TEXAS

PROJ NO. 59752 FILE NAME: Falcon Refinery Base Map

KLEINFELDER
Bright People. Right Solutions.
1826 Kramer Lane, Suite M, Austin, TX 78758
Phone: 512-926-6650 Fax: 512-833-5058
www.kleinfelder.com

FIGURE

9

N

0 375 750 1,500 2,250 3,000

Feet

DATE DRAWN: 04/09	DATE REVISED: 05/09
DRAFTED BY:	C. SEATON
CHECKED BY:	S. HALASZ
APPROVED BY:	

Background Sampling Location Map

FALCON REFINERY
INGLESIDE, SAN PATRICIO COUNTY, TEXAS

PROJ NO. 59752 | FILE NAME: Falcon Refinery Base Map

KLEINFELDER
Bright People. Right Solutions.
1826 Kramer Lane, Suite M, Austin, TX 78758
Phone: 512-926-6650 Fax: 512-833-5058
www.kleinfelder.com

FIGURE

10

KLEINFELDER
Bright People. Right Solutions.

TABLES

1. AREAS OF CONCERN
2. SUMMARY TABLE OF CALCULATED MINIMUM SAMPLE QUANTITIES
3. FIELD SAMPLING DESIGN

TABLE 1
AREAS OF CONCERN
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

AOC	LOCATION		SURFACE WATER SAMPLE NUMBER	SAMPLE LOCATION NUMBER	MONITOR WELL/GROUNDWATER LOCATONS	COPCs
1N	North section of the Refinery complex, on the northeast side of the FM 2725/Bishop Rd. intersection.	Surface Soil Subsurface Soil Groundwater		G2-01S - G2-04S	MW01-01 - MW01-02	Metals VOCs SVOCs PCBs Pesticides
1S	South section of the Refinery complex, on the southwest side of the FM 2725/Bishop Rd. intersection.	Surface Soil Subsurface Soil Groundwater		G2-05S - G2-24S	MW-03 - MW-07	Metals VOCs SVOCs PCBs Pesticides
2	On-site non-process areas, west of the south section of the Refinery complex.	Surface Soil Subsurface Soil		G2-25S - G2-28S		Metals VOCs SVOCs PCBs Pesticides
3	Wetlands	Surface Soil Subsurface Soil Sediment Surface Water	G2-01SW - G2-16SW	G2-01SD - G2-06SD		Metals VOCs SVOCs PCBs Pesticides
4	Current barge docking site	Surface Soil Subsurface Soil		G2-29S - G2-33S		Metals VOCs SVOCs PCBs Pesticides
5	Redfish Bay adjacent to current barge docking facility	Sediment Surface Water		G2-07SD - G2-13SD		Metals VOCs SVOCs PCBs Pesticides
6	Neighborhood **					
7	Neighborhood **					
BG	To be determined	Surface Soil Subsurface Soil Groundwater Sediment Surface Water	BG-15SW - BG20-SW	BG-09S - BG-14S BG-15SDW - BG-20SDW BG-21SDI - BG-26SDI	TWBG-09 - TWBG-14	Metals VOCs SVOCs

* Due to flucuations in surface water locations within wetlands, exact locations are not listed.
** May require sampling after Phase II addendum No. 1

AOC Area of Concern
COPC Contaminant of Potential Concern
VOC Volatile Organic Compound
GW groundwater
BKG Background
SVOC Semi-volatile Organic Compound
SD Sediment
SW Surface water

TABLE 2
SUMMARY OF CALCULATED MINIMUM SAMPLE QUANTITIES
FALCON REFINERY
INGLESIDE, TEXAS

AOC	Media	Quantity of Discrete Phase I Samples	Additional Sample Number Basis			Proposed Quantity of Additional Samples
			Human Health	Ecological	Best Professional Judgment	
AOC 1	Soil: Surface & Subsurface	41	14	None	Not Applicable	24
	Sediment	2	Not Applicable	Not Applicable	None	None
	Groundwater	20	7	Not Applicable	Not Applicable	7
AOC 2	Soil: Surface & Subsurface	Composite Samples	Not Applicable	Not Applicable	4	4
AOC 3	Soil: Surface & Subsurface	7	1	14	None	None
	Sediment	44	None	None	6	6
	Surface Water	7	16	5	Not Applicable	16
AOC 4	Soil: Surface & Subsurface	Composite Samples	Not Applicable	Not Applicable	5	5
AOC 5	Sediment	3	Not Applicable	Not Applicable	7	7
AOC 6	Soil: Surface & Subsurface	3	Not Applicable	Not Applicable	None	None
AOC 7	Soil: Surface & Subsurface	2	Not Applicable	Not Applicable	None	None

TABLE 3

SAMPLING AND DESIGN MATRIX
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

SAMPLING TYPE	AREA OF CONCERN NUMBER	INTERVAL (feet bgs)	ANALYSES				
			TCL VOC	TCL SVOC	TAL METALS	PCBs	Herbicides and Pesticides
ON-SITE RANDOM GRID SURFACE AND SUBSURFACE SOIL SAMPLES							
Geoprobe	1N	0 to 0.5	4	4	4	1	1
		0.5 to 5.0	4	4	4	1	1
	1S	0 to 0.5	20	20	20	2	2
		0.5 to 5.0	20	20	20	2	2
TOTAL FOR ON-SITE AOC-1 RANDOM GRID SAMPLES			**48**	**48**	**48**	**6**	**6**
QC FOR RANDOM GRID SAMPLES							
QC MS/MSD* {1/20 organics}		Various	3	3	N/A	N/A	1
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	1	N/A
QC trip blank		1	N/A	N/A	N/A	N/A	N/A
QC field duplicate {1/10}		Various	5	5	5	1	1
QC EQUIPMENT RINSATE		N/A	2	2	2	1	1
TOTALGRID QC SAMPLES			**10**	**10**	**7**	**3**	**0**
Geoprobe	2	0 to 0.5	4	4	4	1	1
		0.5 to 5.0	4	4	4	1	1
	4	0 to 0.5	5	5	5	1	1
		0.5 to 5.0	5	5	5	1	1
TOTAL FOR ON-SITE AOC-2 and AOC-4 RANDOM GRID SAMPLES			**18**	**18**	**18**	**4**	**4**
QC FOR GRID SOIL SAMPLES							
QC MS/MSD* {1/20 organics}		Various	1	1	N/A	N/A	1
QC MS/MD* {1/20 organics}		Various	1	1	N/A	N/A	N/A
QC trip blank		1	1	1	N/A	1	N/A
QC field duplicate {1/10}		Various	2	2	2	1	1
QC equipment rinsate		N/A	1	1	1	1	1
TOTAL GRID QC SAMPLES			**6**	**6**	**3**	**3**	**3**

TABLE 3

SAMPLING AND DESIGN MATRIX
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

SAMPLING TYPE	AREA OF CONCERN NUMBER	INTERVAL (feet bgs)	ANALYSES				
			TCL VOC	TCL SVOC	TAL METALS	PCBs	Herbicides and Pesticides
OFF-SITE JUDGMENTAL SURFACE AND SUBSURFACE SAMPLES							
Geoprobe	3	0 to 0.5	0	0	0	0	0
		0.5 to 5.0	0	0	0	0	0
	5	0 to 0.5	0	0	0	0	0
	6	0 to 0.5	0	0	0	0	0
		0.5 to 5.0	0	0	0	0	0
	7	0 to 0.5	0	0	0	0	0
		0.5 to 5.0	0	0	0	0	0
TOTAL FOR ON-SITE JUDGMENTAL SAMPLES			**0**	**0**	**0**	**0**	**0**
QC FOR OFF-SITE JUDGMENTAL SAMPLES							
QC MS/MSD* {1/20 organics}		Various	0	0	N/A	N/A	0
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	0	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	N/A	N/A	N/A	N/A	N/A
QC field duplicate {1/10}		Various	0	0	0	0	0
QC EQUIPMENT RINSATE		N/A	0	0	0	0	0
TOTAL JUDGMENTAL QC SAMPLES			**0**	**0**	**0**	**0**	**0**
OFF-SITE RANDOM GRID SEDIMENT SAMPLES							
Grab	3	0-0.5	6	6	6	1	1
	5	0-0.5	7	7	7	1	1
TOTAL FOR GRID SAMPLES			**6**	**6**	**6**	**1**	**1**
QC FOR GRID SOIL SAMPLES							
QC MS/MSD* {1/20 organics}		Various	1	1	N/A	N/A	1
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	N/A	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	N/A	N/A	N/A	N/A	N/A
QC field duplicate {1/10}		Various	1	1	1	1	1
QC equipment rinsate		N/A	1	1	1	1	1
TOTAL GRID QC SAMPLES			**3**	**3**	**2**	**2**	**0**

TABLE 3

SAMPLING AND DESIGN MATRIX
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

SAMPLING TYPE	AREA OF CONCERN NUMBER	INTERVAL (feet bgs)	ANALYSES				
			TCL VOC	TCL SVOC	TAL METALS	PCBs	Herbicides and Pesticides
GROUNDWATER SAMPLING (7 Monitor Wells)							
Bailer	1N	Shallow aquifer	2	2	2	1	1
	1S	Shallow aquifer	5	5	5	1	1
TOTAL FOR MONITOR WELL SAMPLES			**7**	**7**	**7**	**2**	**2**
QC FOR AQUEOUS SAMPLES (MONITOR WELLS)							
QC MS/MSD* {1/20 organics}		Various	1	1	N/A	N/A	1
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	0	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	2	1	N/A	N/A	N/A
QC field duplicate {1/10}		Various	1	1	1	1	1
QC Equipment Rinsate		Various	1	1	1	1	1
TOTAL MONITOR WELL QC SAMPLES			**5**	**4**	**2**	**2**	**3**
SURFACE WATER SAMPLING							
Grab	3	Surface	16	16	16	2	2
TOTAL FOR SURFACE WATER SAMPLES			**16**	**16**	**16**	**2**	**2**
QC FOR AQUEOUS SAMPLES (SURFACE WATER)							
QC MS/MSD* {1/20 organics}		Various	1	1	N/A	N/A	1
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	0	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	2	2	N/A	N/A	N/A
QC field duplicate {1/10}		Various	2	2	1	1	1
QC Equipment Rinsate		Various	1	1	1	1	1
TOTAL QC SAMPLES			**6**	**6**	**2**	**2**	**3**

TABLE 3

SAMPLING AND DESIGN MATRIX
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

SAMPLING TYPE	AREA OF CONCERN NUMBER	INTERVAL (feet bgs)	ANALYSES				
			TCL VOC	TCL SVOC	TAL METALS	PCBs	Herbicides and Pesticides
BACKGROUND SAMPLES (JUDGMENTAL)							
Grab	Sediment	0-0.5	12	12	12	0	0
Geoprobe	Surface Soil	0-0.5	6	6	6	0	0
	Subsurface Soil	0.5-5.0	6	6	6	0	0
TOTAL FOR JUDGMENTAL SAMPLES			**24**	**24**	**24**	**0**	**0**
BACKGROUND GROUNDWATER SAMPLING (6 Temporary Wells)							
Bailer	Groundwater	Shallow aquifer	6	6	6	0	0
TOTAL FOR JUDGMENTAL SAMPLES			**6**	**6**	**6**	**0**	**0**
BACKGROUND SURFACE WATER SAMPLING							
Grab	Surface Water	Surface	6	6	6	0	0
TOTAL FOR GRID and BACKGROUND SW SAMPLES			**6**	**6**	**6**	**0**	**0**
QC FOR ALL BACKGROUND SAMPLING							
QC MS/MSD* {1/20 organics}		Various	2	2	N/A	N/A	0
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	0	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	2	2	N/A	N/A	N/A
QC field duplicate {1/10}		Various	4	4	4	0	0
QC Equipment Rinsate		Various	1	1	1	0	0
TOTAL QC SAMPLES			**9**	**9**	**5**	**0**	**0**
INVESTIGATION-DERIVED WASTE							
Hand sampling device	Site-wide	Drummed Waste	TO BE DETERMINED				
QC FOR INVESTIGATION-DERIVED WASTE							
QC MS/MSD* {1/20 organics}		Various	0	0	N/A	N/A	0
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	0	N/A

TABLE 3

SAMPLING AND DESIGN MATRIX
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

SAMPLING TYPE	AREA OF CONCERN NUMBER	INTERVAL (feet bgs)	ANALYSES				
			TCL VOC	TCL SVOC	TAL METALS	PCBs	Herbicides and Pesticides
QC trip blank {1/cooler for aqueous VOCs}		N/A	0	N/A	N/A	N/A	N/A
QC field duplicate {1/10}		Various	0	0	0	0	0
QC Equipment Rinsate		Various	0	0	0	0	0
TOTAL QC SAMPLES			**0**	**0**	**0**	**0**	**0**

* MS/MSD and MS/MDs: These samples do not increase the number of samples, but represent additional volume of sample for laboratory QA/QC.

AOC	Area of Concern	N/A	Not Applicable
bgs	Below Ground Surface	PCB	Polychlorinated Byphenyls
MD	Matrix Duplicate	QC	Quality Control
MS	Matrix Spike	SVOC	Semivolatile Organi
MSD	Matrix Spike Duplicate	VOC	Volatile Organic Compound

KLEINFELDER
Bright People. Right Solutions.

APPENDIX A

PHASE 1 ANALYTICAL RESULTS FIGURES

KLEINFELDER
Bright People. Right Solutions.

APPENDIX B

PHASE 1 ANALYTICAL RESULTS FROM ACCUTEXT

KLEINFELDER
Bright People. Right Solutions.

APPENDIX C

VSP REPORTS OF CALCULATED MINIMUM SAMPLE

KLEINFELDER
Bright People. Right Solutions.

APPENDIX D

DETAILED SUMMARIES OF MINIMUM SAMPLE SIZE EQUATIONS

KLEINFELDER
Bright People. Right Solutions.

APPENDIX E

STANDARD OPERATION PROCEDURE 21 (SOP)